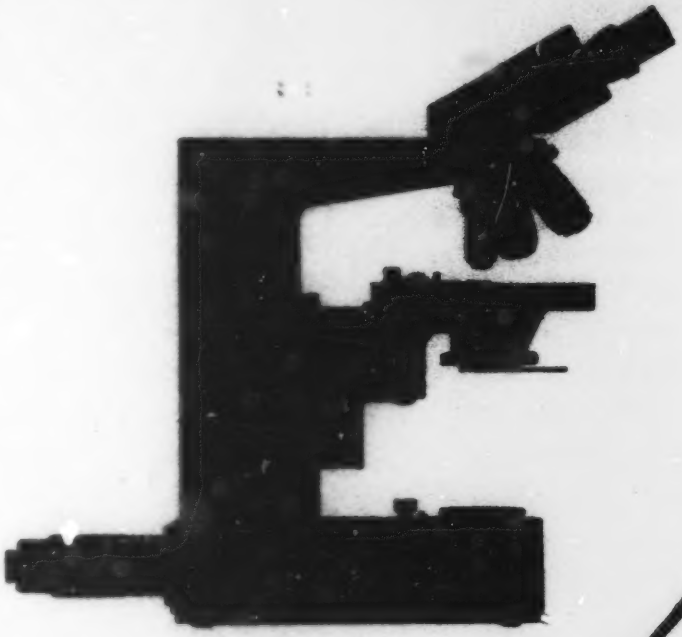
Dairy Laboratory Quality Testing Summary



1982 Annual Report

MANITOBA
AGRICULTURE
Animal Industry Branch
Dairy Section

F O R E W O R D

The following report contains the annual summary of test results of the Dairy Laboratory of the Animal Industry Branch, Manitoba Agriculture. The Laboratory is located at the Agricultural Services Complex, University of Manitoba, Winnipeg.

Samples analysed at the laboratory continue to provide information on dairy products and milk samples for quality control, health requirements, payment to producers, and extension activities within the dairy industry. The analyses performed to provide this information cover a variety of test procedures. The 1982 data is summarized in the tables included in this report.

The first Milko Scan 203 was put into use in 1979 and has been operational since that time. Results for fat, protein, and lactose are determined on all producer herd samples as well as on cow samples for the centrally tested D.H.I.A. and Owner Sampler programs.

Due to the integration of the DHIA program into Central testing and the significant growth in this program, a considerable increase in work load was experienced in the milk composition unit of the Dairy Laboratory. This integration was completed in 1980. To handle the additional sample load a second Milko Scan 203 was put in line. Information on Butterfat-protein inversions continues to be available to extension personnel as an aid in correcting the problems of feeding and herd management.

All tests for payment purposes for the Manitoba Milk Producers' Marketing Board are done weekly by the Milko Scan 203, on fresh milk samples. These weekly test results are transmitted to the Marketing Board via computer interchange, with the butterfat results used to determine the value of milk shipments based on a butterfat differential. Protein and lactose results continue to be entered in the computer storage tape for possible future use.

In 1981 a Hewlett Packard 85 instrument controller was interfaced with the Milko Scan 203. All producer test data from the Milko Scan continue to be automatically recorded on tape and then transferred to the Milk Marketing Board Computer via telephone line.

LABORATORY STAFF

D. M. Macaulay, BSA., MSc	Dairy Laboratory Specialist
Mary Anne Kuebler, BSc	Supervisor, Microbiology Lab.
Lynne Macaulay	Supervisor, Milk Composition Lab.
On Chan, BSc	Technicain
B. Kupskay, BSc, MSc	Technician
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Ed P. Taylor	Technician
Tannis Paton, BSc	Technician
Patty Smyth Lotecki, BSA.,.	Technician

DAIRY LABORATORY FUNCTIONS

The Dairy Laboratory is a central testing facility within the Dairy Section of the Animal Industry Branch, Manitoba Agriculture. The basic functions of the laboratory are:

1) Testing of raw milk to insure that it meets the quality requirements as outlined in the Dairy Act and Public Health Act.
2) Testing of pasteurized dairy products to insure that all Public Health safeguards are met and to provide information on keeping quality estimation.
3) Testing of pasteurized dairy products to insure that all composition paramenters are maintained.
4) Testing for butterfat and other components as a basis of payment to milk producers.
5) Milk Composition testing for Dairy Herd Improvement Association and Owner Sampler Milk Recording programs.
6) Assistance to field staff and industry in solving quality problems.

SAMPLING

1) The procedure in use for raw milk, involves the aseptic collection of a universal milk sample that can be used for both bacteriological and compositional analyses. Each milk shipper is supplied with sterile "whirl-pak" plastic bags, identified with his name and number. These bags are used for representative sampling by the Bulk Milk Grader at each Bulk Milk pick-up. The milk samples so collected are stored in an ice water container on the truck and then transferred to a refrigerated storage at the dairy plant prior to delivery to the laboratory. All samples are delivered to the dairy laboratory within 48 hours of pick-up and must arrive at a temperature below $5^{o}C$.
2) Sampling and testing of all pasteurized fluid products is done not less than once per week. The products include cottage cheese, sour cream, cream cheese spread, as well as fluid milk products. Butter and cheddar cheese samples for bacteriological examinations are taken not less than once per month from all manufacturing plants in the Province.

RAW MILK QUALITY

ARTEK AUTOMATIC COLONY COUNTER

Used for counting of Standard Plate Counts and Plate Loop Counts on raw and pasteurized milk samples.

Plate loop bacteria counts are done for each milk producer once per month to insure that bacteriological standard for acceptable milk of "not more than 100,000 per ml" is maintained. It is generally agreed that if milk has been produced and handled properly there should be no difficulty in maintaining a bacteria count of less than 100,000/ml. In fact, over 80% of the producer samples have counts of less than 50,000 (Table 1). Since most of the bacteria present in raw milk produce enzymes capable of producing defects in the pasteurized product their numbers should be low to insure that the final product is of good quality.

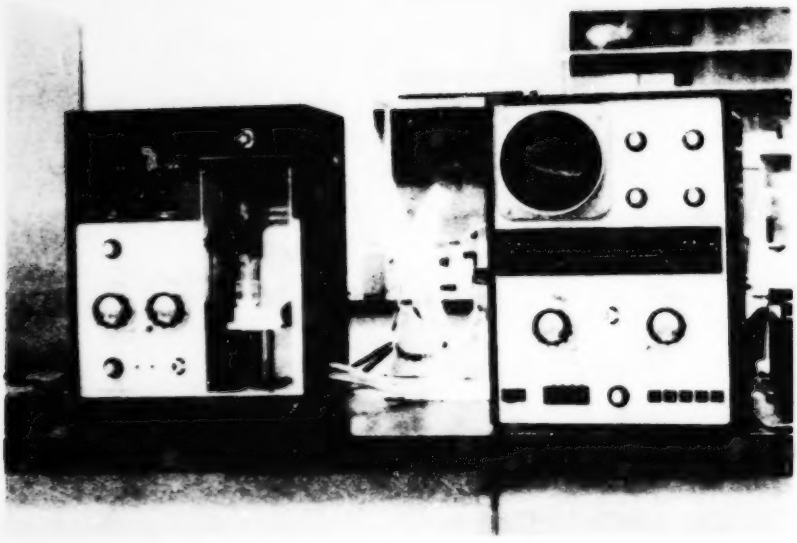
TABLE 1

RAW MILK QUALITY - 1982

PLATE LOOP COUNTS

(Counts per ml)

MONTH	PRODUCER SAMPLES	LESS THAN <50,000	PERCENT <50,000	50,000 TO 100,000	PERCENT 50-100,000	LESS THAN <75,000	PERCENT	MORE THAN >100,000	PERCENT >100,000	PLATE LOOP SAMPLES
JANUARY	1265	1105	87.4	140	11.1	1179	93.2	20	1.6	1574
FEBRUARY	1250	1048	83.8	172	13.8	1132	90.6	30	2.4	1480
MARCH	1254	1069	85.2	163	13.0	1149	91.6	24	1.9	1581
APRIL	1242	1089	87.7	163	10.8	1176	94.7	15	1.2	1484
MAY	1250	1037	83.0	185	14.8	1156	92.5	28	2.2	1600
JUNE	1237	1035	83.7	153	12.4	1133	91.6	38	3.1	1544
JULY	1214	955	78.7	207	17.1	1085	89.4	47	3.9	1473
AUGUST	1219	888	72.8	272	22.3	1079	88.5	54	4.4	1556
SEPTEMBER	1229	1039	84.5	156	12.7	1190	96.8	26	2.1	1481
OCTOBER	1225	1020	83.3	171	14.0	1126	91.9	28	2.3	1482
NOVEMBER	1228	1068	87.0	137	11.2	1154	94.2	18	1.5	1713
DECEMBER	1221	1039	85.1	169	13.8	1134	92.9	13	1.1	1444
YEARLY TOTAL	14,834	12,392	83.5	2,088	14.1	13,693	92.3	341	2.3	18,412



COULTER COUNTER AND COULTER CHANNELYZER

The Coulter Counter is used for electronically counting somatic cells in milk. Coulter Channelyzer is used to determine the range of Somatic Cell sizes in the milk sample.

Somatic cell counts are done on all milk producer samples once per month. The cell count is reported on a per ml. basis and includes all "body cells" occurring in the milk such as leukocytes and epithelial cells. (Summarized in Table 2). The main cause for elevated cell counts are bacterial infection, mechanical injury from the milking machine, or other "stress" factors as well as stage of lactation. Associated with elevated cell counts are altered milk composition, flavour defects, decreased milk production, and low yields in cheese production. Producers with consistently high cell counts may be given special attention by the Farm Services Staff in an attempt to find the causes for the high cell count. An important first step is to analyze the milking equipment and methods used. When recommended corrections are made in the herd, an aseptic sample is taken from each quarter of every cow, for analysis on the Coulter Counter and Channelyzer. Selected quarter samples, in addition to examination for cell size distribution, are cultured to determine if there is a bacteriological cause for the elevated count.

TABLE 2

SOMATIC CELL COUNTS - 1982

(Counts per ml)
(m= million)

MONTH	PRODUCERS TESTED	<500,000	%	500 to 1m	%	1m to 1.4m	%	1.5m or >	%
JANUARY	1262	732	58.0	414	32.8	80	6.4	30	2.4
FEBRUARY	1266	688	54.3	454	36.4	89	7.0	35	2.8
MARCH	1220	562	46.0	499	40.9	121	9.9	38	3.1
APRIL	1164	644	55.3	426	36.6	69	5.9	25	2.1
MAY	1215	487	40.1	498	40.9	168	13.8	62	5.1
JUNE	1205	588	48.9	500	41.5	91	7.8	26	2.6
JULY	1242	527	42.4	577	46.5	102	8.2	36	2.9
AUGUST	1040	339	32.6	533	51.0	121	11.6	47	4.5
SEPTEMBER	1216	461	37.9	593	48.8	122	10.0	40	3.2
OCTOBER	1201	439	36.6	561	46.7	144	12.0	57	4.7
NOVEMBER	982	464	47.0	391	39.8	98	10.0	29	3.0
DECEMBER	1195	582	48.7	487	40.7	95	7.9	31	2.6
TOTAL	14,208	6,513	45.8%	5,933	41.8%	1,300	9.1%	456	3.2%

< 500,000	6,513	(45.8%)
500,000 to 1m	5,933	(41.8%)
1.0 to 1.4m	1,300	(9.1%)
1.5m or more	456	(3.2%)

1357 quarter samples were checked on the Coulter Counter.

924 DMSCC controls were done as a check on Coulter Counter.

TABLE 3

MEAN CELL COUNTS ON

HERD BULK MILK - COULTER COUNTER

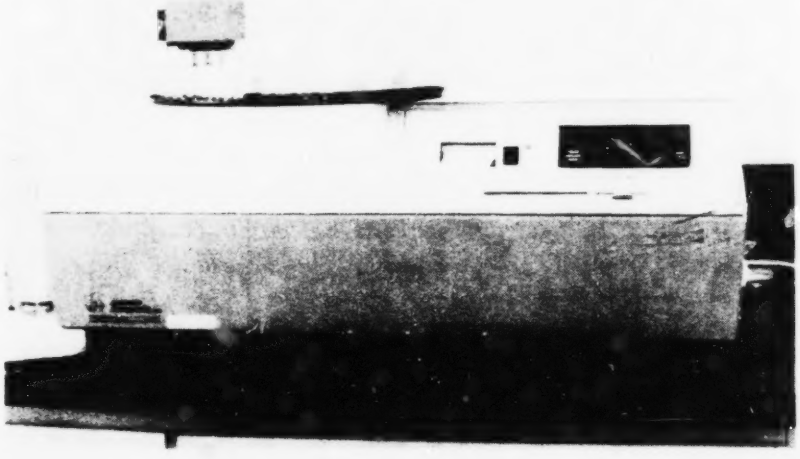
(Counts per ml)

MONTH	1977	1978	1979	1980	1981	1982
JANUARY	680,000	745,000	684,000	738,000	744,000	544,000
FEBRUARY	774,000	745,000	600,000	720,000	814,000	579,000
MARCH	740,000	758,000	647,000	744,000	696,000	625,000
APRIL	754,000	672,000	622,000	781,000	629,000	542,000
MAY	747,000	705,000	600,000	805,000	612,000	688,000
JUNE	787,000	699,000	660,000	750,000	626,000	620,000
JULY	879,000	769,000	724,000	840,000	622,000	625,000
AUGUST	920,000	765,000	842,000	970,000	561,000	718,000
SEPTEMBER	881,000	684,000	899,000	828,000	571,000	658,000
OCTOBER	815,000	715,000	777,000	757,000	520,000	689,000
NOVEMBER	813,000	751,000	811,000	735,000	510,000	634,000
DECEMBER	789,000	760,000	766,000	718,000	540,000	594,000
AVERAGE	798,000	741,000	748,000	778,000	629,000	625,000

ANTIBIOTIC TESTING PROGRAM

In all milk markets the presence of detectable amounts of antibiotics in the milk supply is of concern for two reasons: (1) Presence of antibiotics in milk, particularly penicillin may cause an allergic reaction in persons who are sensitive to it. (2) The presence of small amounts of antibiotics slows or stops the growth of the bacterial culture used in the milk for cultured products and cheese, resulting in loss of production and "dumping" of the milk.

The Dairy Laboratory monitors all shipper samples once per month using Bacillus subtilis disc assay, ½" disc, in addition to checking all tank truck samples. When a shipper sample is found to be "positive" for antibiotics, the producer, farm services inspector and hauler are notified for corrective action. As a result the producer receives a penalty deduction from the Milk Marketing Board. Also, shipments from the producer are not resumed until a negative test is obtained.



4C11 CRYOSCOPE for detection of added water in milk. Operates automatically including printouts of freezing points.

All Milk producer and truck samples are monitored at least once per month. When a reading of -0.524° or higher is obtained on a producer sample it is considered to be adulterated. The Marketing Board is notified and that shipment is paid for at a reduced price.

TABLE 4

ANTIBIOTIC TESTING PROGRAM - 1982

MONTH	PRODUCERS TESTED	TOTAL TESTS DONE	PRODUCERS POSITIVE	PER CENT OF PRODUCERS IN PENALTY
JANUARY	1,265	2,197	1	.08%
FEBRUARY	1,250	2,010	4	.32%
MARCH	1,240	2,017	3	.24%
APRIL	1,242	2,161	1	.08%
MAY	1,241	2,255	3	.24%
JUNE	1,237	2,207	0	0
JULY	1,235	2,036	2	.16%
AUGUST	1,240	2,026	5	.40%
SEPTEMBER	1,238	2,058	0	0
OCTOBER	1,225	2,058	4	.33%
NOVEMBER	1,228	2,061	1	.08%
DECEMBER	1,227	1,856	1	.08%
TOTAL	14,868	24,982	25	

For the year there were .17% of the milk producers with positive antibiotics.
.10% of all samples tested were positive for antibiotics.

FINISHED PRODUCT TESTING

Bacteriological standards for processed and manufactured dairy products are set out by Regulation. These include Standard Plate Counts and Coliform counts on fluid milk products, Coliform and Staphylococcus counts on cheddar and specialty cheese products. Butter is tested for yeast and mold counts and proteolytic bacteria counts.

The standard for non-cultured fluid milk products is "not more than 10 Coliform bacteria per ml." and "not more than 20,000 Standard Plate Count per ml. The standard for cultured products is "not more 10 Coliforms per ml. The standard for butter is "not more than 10 yeast and molds per gram". Products exceeding the standards are retested and if found to exceed the standard, the product is subject to recall from the market.

Testing for various bacteria in pasteurized dairy products is done to determine potential sanitary problems at the dairy plant. High bacteria counts in the packaged product is largely due to post pasteurization contamination. In addition, all pasteurized dairy products are tested for adequate pasteurization by the use of the phosphatase test. Products which have not been heated to pasteurization temperature for sufficient time, or have been contaminated with small amounts of raw milk, will fail the test. If a product gives a positive test it is subject to immediate recall from the market.

The Standard Plate Count and Coliform count are used as a measure on pasteurized fluid products of the sanitary handling of the milk at the dairy plant. The types of bacteria found in pasteurized milk are predominately spoilage organisms and usually cause flavor defects. When there is a low bacteria count in the pasteurized milk usually it has a longer storage life and improved flavor and quality.

TABLE 5

FINISHED PRODUCT QUALITY - 1982

PRODUCT	COLIFORM COUNTS NUMBER OF TESTS	>10/ml	%>10/ml	STANDARD PLATE COUNT NUMBER OF TESTS	>20,000/ml	%>20,000/ml
Homo	810	13	1.6%	864	5	.6%
Low Fat Homo	607	9	1.5%	645	3	.5%
Cereal Cream	617	11	1.8%	645	6	.9%
Whipping Cream	419	1	.2%	418	13	3.1%
Chocolate Drink	326	3	.9%	325	11	3.4%
Skim Milk	450	3	.7%	466	3	.6%
Ice Cream	229	22	9.6%	264	22	8.3%
Ice Cream Mix	236	11	4.7%	248	10	4.0%
Cottage Cheese	191	4	2.1%			
Buttermilk	152	1	.7%			
Salad Cream	136	7	5.1%			
TOTAL	4,173	85	2.0%	3,879	73	1.9%

KEEPING QUALITY TESTS

This program was continued in 1982 with 241 Homogenized Milk and 161 low fat 2% samples tested.

Many flavor defects in pasteurized products are due to bacterial growth during storage. Routine bacteria counts are done on freshly pasteurized product picked up at the Dairy Plant and are very low (less than 300 per ml), however the maximum standard is 20,000/ml. These same samples, when held for 5 days @7°C and then tested, may still have a low count or may have increased to 250,000 per ml or more. The bacteria count after storage is from bacteria which can grow at low temperatures and is indicative of the degree of contamination of the pasteurized product by psychrotrophic bacteria. If a processing plant produces low counts after storage (5 days @ 7°C), shelf life and flavor quality is likely to be improved. The basis of the test is to detect potential spoilage bacteria which will shorten the shelf life of the pasteurized product. Note Table 6, less than 0.8% of the fresh samples tested were over 20,000 standard plate counts while 19.9% of samples tested after storage for 5 days at 7°C had counts of over 250,000 per ml.

CRYOSCOPE ON PASTEURIZED PRODUCTS

Under the Dairy Act, milk is considered adulterated if by test it is determined that there is "added water" in the product. The degree of adulteration is determined by measuring the freezing point of the milk, similar to the test used on raw milk. A freezing point of -0.524° or higher is considered to be adulterated and such products are subject to recall. Pasteurized products regularly tested are Homogenized milk, Low Fat Homo, and Skim Milk.

TABLE 6

KEEPING QUALITY TESTS 1982

(5 days @ 7°C then SPC)

PRODUCT	TOTAL	< 50,000/ml	51 - 100,000/ml	101 - 250,000/ml	>250,000/ml
Homo	241	172 (71.4%)	6 (2.5%)	10 (4.1%)	53 (22.0%)
Low Fat Homo 2%	161	117 (72.7%)	10 (6.2%)	7 (4.3%)	27 (16.8%)

Initial tests on all samples were less than 20,000 except for 3 samples of 2% milk.

PHOSPHATASE TESTING

Products Tested: Homo, 2%, Skim, Cereal Cream, Whipping Cream, Ice Cream Mix, and Cottage Cheese.

Total number of tests: 3,452

1 lot of Cereal Cream and 1 lot of Whipping Cream were positive for phosphatase

The phosphatase test is used to determine if a product has been properly pasteurized or if the pasteurized product has been recontaminated with raw product. The test measures residual phenol in the sample. Raw milk gives a high phenol reading while a pasteurized sample will give values of less than 2 ug of phenol equivalent per 0.5 ml of fluid dairy product; or for cheese, a reading of less than 2 ug of phenol equivalent per 0.25 gm. Results showing more than 2 ug are reported as positive phosphatase.

TABLE 7

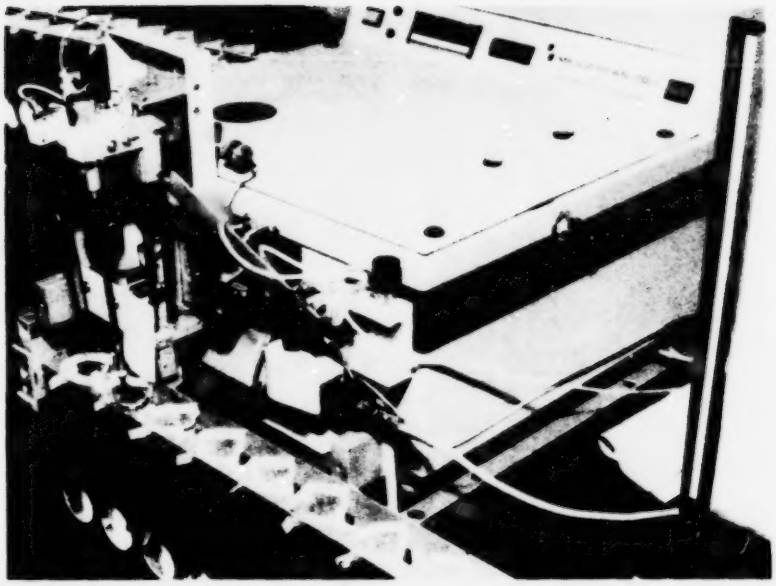
CRYOSCOPE - RAW MILK - 1982

MONTH	PRODUCER SAMPLES	-0.524° OR HIGHER	PERCENT	NORMAL	PERCENT	TRUCK SAMPLES	-0.524° OR HIGHER	PERCENT	TOTAL CRYOSCOPES
JAN.	1,265	5	.40	1,260	99.6	123	0	0	1,388
FEB.	1,332	4	0	1,328	99.7	127	0	0	1,459
MAR.	1,301	5	.38	1,296	99.6	126	0	0	1,427
APR.	1,312	9	.69	1,303	99.3	128	0	0	1,440
MAY	1,324	5	.38	1,319	99.6	144	0	0	1,468
JUNE	1,327	5	.38	1,322	99.6	137	0	0	1,464
JULY	1,241	6	.48	1,235	99.4	126	0	0	1,367
AUG.	1,237	4	.32	1,233	99.7	131	0	0	1,368
SEPT.	1,168	8	.68	1,160	99.3	132	0	0	1,300
OCT.	1,278	5	.39	1,273	99.5	119	0	0	1,397
NOV.	1,282	4	.31	1,278	99.7	129	0	0	1,411
DEC.	1,227	5	.41	1,222	99.6	128	0	0	1,355
TOTAL	15,294	65	.43	15,229	99.57%	1,550	0	0	16,844

TABLE 8

CRYOSCOPE - PASTEURIZED MILK - 1982

MONTH	TOTAL	FREEZING POINT -0.524° OR HIGHER		PER CENT -0.524° OR HIGHER
JANUARY	165	2		1.2
FEBRUARY	133	1		.8
MARCH	171	3		1.8
APRIL	144	6		4.2
MAY	129	5		3.9
JUNE	152	3		2.0
JULY	182	5		2.7
AUGUST	173	5		2.9
SEPTEMBER	143	3		2.1
OCTOBER	141	4		2.8
NOVEMBER	118	1		.8
DECEMBER	116	2		1.7
TOTAL	1,767	40	AVERAGE	2.3%

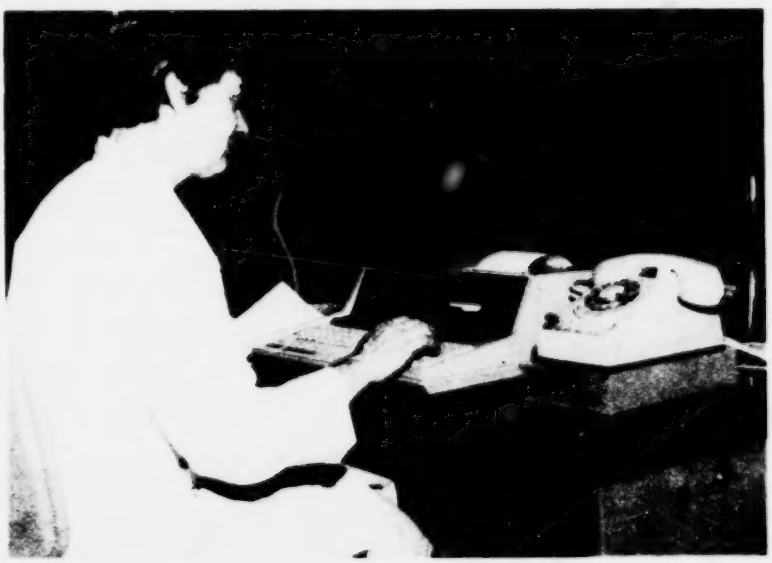


MILKO SCAN 203

Tests for fat, protein and lactose by infrared. This equipment can test up to 220 samples per hour.

Butterfat, protein and lactose is determined on raw milk samples for the Dairy Herd Improvement Association, Owner Sampler programs and the Manitoba Milk Producers' Marketing Board. The Manitoba Milk Producers' Marketing Board use the butterfat tests as a basis of payment with protein and lactose results being stored for future use. Table 12 gives a summary of the average monthly fat tests for 1981 and 1982. The average protein tests are included for the same period. Table 13 gives average lactose comparisons for 1981 and 1982.

Butterfat testing of pasteurized dairy products is done to determine if each product meets the legal standard for butterfat. The minimum butterfat content for each product is stated on the container. Dairy products are subject to recall by the dairy plant if three consecutive tests are outside the acceptable limit.



Hewlett Packard 85 Controller

TABLE 9

TESTS PERFORMED IN MILK COMPOSITION LAB. FOR THE YEAR 1982

MONTH	FARM TANK SAMPLES	BUTTERFAT ON DHIA	BUTTERFAT ON O/S	TOTAL PROTEINS & LACTOSE
JANUARY	4,924	6,074	3,700	14,698
FEBRUARY	5,053	8,272	3,349	16,674
MARCH	6,390	9,373	3,284	19,047
APRIL	3,999	8,009	3,060	15,068
MAY	5,031	7,720	3,435	18,186
JUNE	4,925	9,436	3,102	17,463
JULY	5,476	6,677	2,797	14,950
AUGUST	5,963	8,237	1,935	16,135
SEPTEMBER	5,280	9,034	2,858	17,172
OCTOBER	5,387	9,209	3,167	17,763
NOVEMBER	6,178	9,672	2,952	18,802
DECEMBER	4,436	7,253	1,887	13,576
TOTAL	63,042	100,966	35,526	199,534

In addition to the regular compositional tests on Producer & DHIA Samples there were samples tested for Laboratory and inter-laboratory comparisons.

Standards for mojonnier, commercial dairies and the University of Manitoba Animal Science Department are also tested. The number of such tests for the year was 2,814.

January	243	August	307
February	94	September	303
March	128	October	550
April	75	November	510
May	40	December	347
June	172	TOTAL	2,814
July	45		

TABLE 10

BUTTERFAT TESTS ON FINISHED PRODUCTS

MONTH	TOTAL TESTS	OUTSIDE STANDARD		PER CENT OUTSIDE STANDARD
JANUARY	300	40		13.3
FEBRUARY	299	21		7.0
MARCH	342	38		11.1
APRIL	343	46		13.4
MAY	317	18		5.7
JUNE	337	36		10.7
JULY	339	43		12.7
AUGUST	318	31		9.7
SEPTEMBER	328	29		8.8
OCTOBER	293	25		8.5
NOVEMBER	255	28		11.0
DECEMBER	250	28		11.2
TOTAL	3721	383	AVERAGE	10.3%

TABLE 11

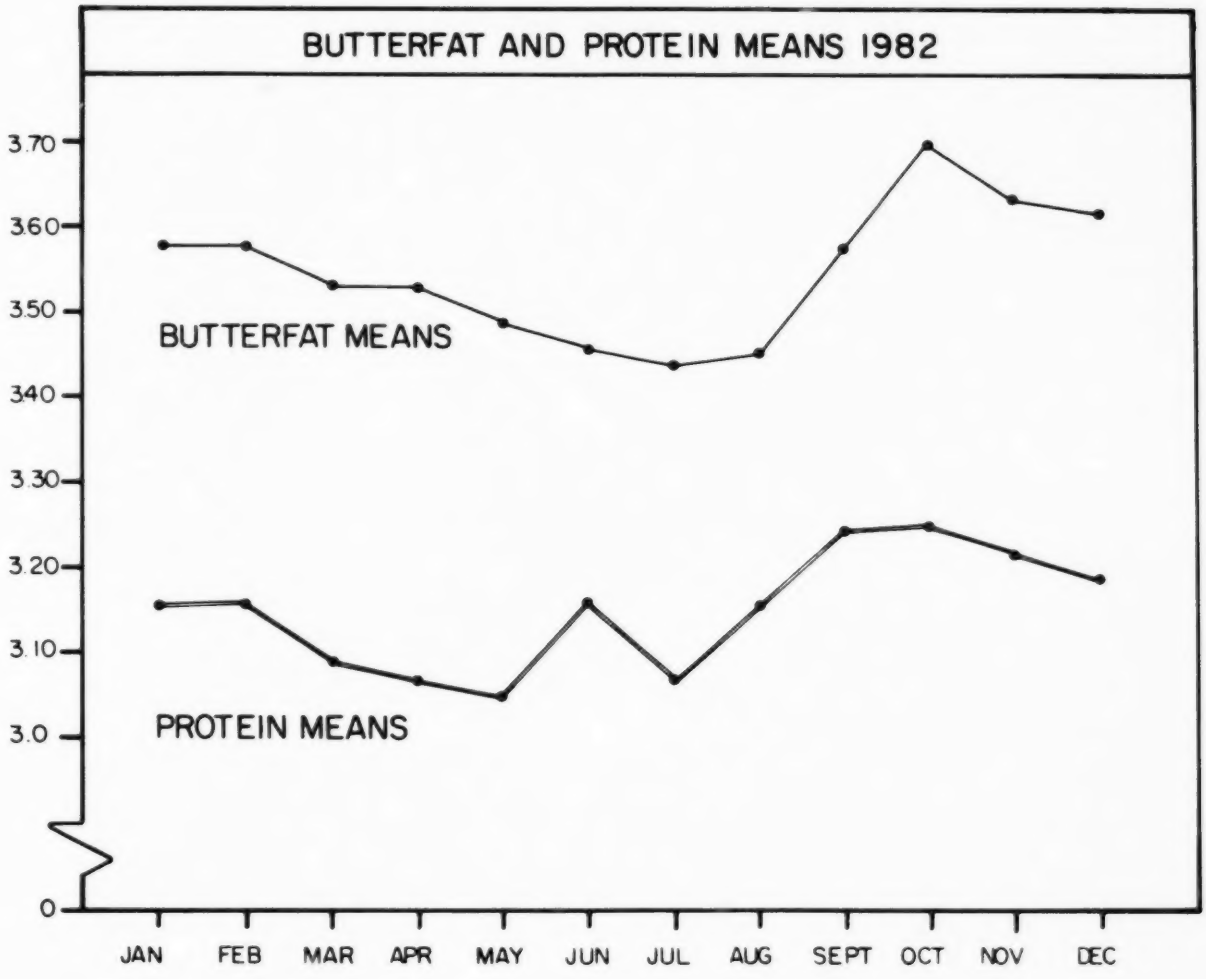
TOTAL COUNTS ON RAW MILK HELD AT

MANITOBA PROCESSING PLANTS

1982

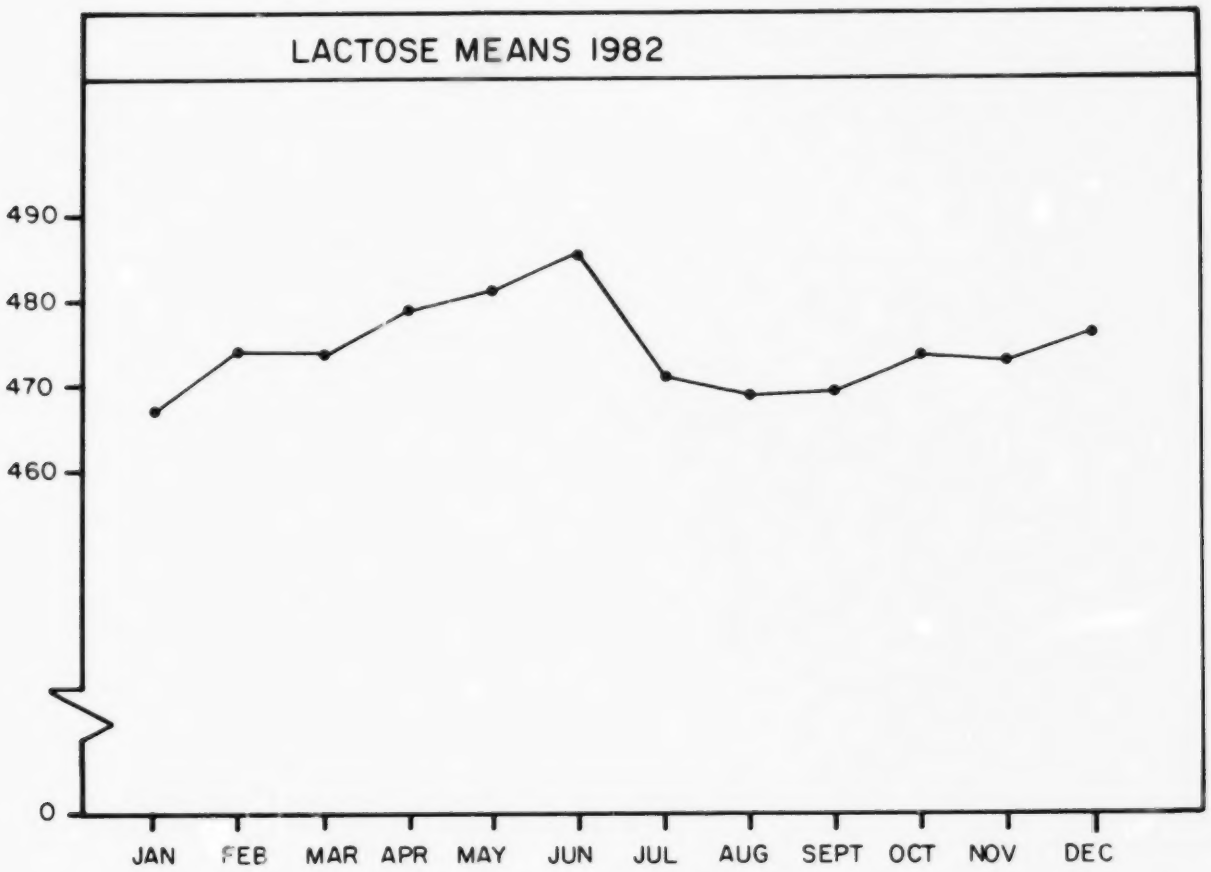
MONTH	TOTAL SAMPLES TAKEN	EXCEEDING 300,000 per ml.
JUNE	42	33%
JULY	8	38%
AUGUST	27	48%
SEPTEMBER	49	33%
OCTOBER	47	21%
NOVEMBER	53	32%
DECEMBER	31	32%
TOTAL	257	32%

TABLE 12



	1981		1982	
	BF	Protein	BF	Protein
Jan.	3.54	3.17	3.58	3.16
Feb.	3.55	3.14	3.58	3.16
Mar.	3.52	3.11	3.53	3.09
Apr.	3.50	3.01	3.53	3.07
May	3.45	3.04	3.49	3.05
June	3.45	3.15	3.46	3.16
July	3.33	3.02	3.44	3.07
Aug.	3.39	3.09	3.46	3.16
Sept.	3.55	3.26	3.58	3.25
Oct.	3.68	3.29	3.70	3.25
Nov.	3.65	3.23	3.64	3.22
Dec.	3.60	3.24	3.62	3.19

TABLE 13



LACTOSE MEANS

	1981	1982
Jan.	4.74	4.67
Feb.	4.73	4.74
Mar.	4.74	4.74
Apr.	4.72	4.79
May	4.75	4.81
June	4.76	4.86
July	4.68	4.71
Aug.	4.70	4.69
Sept.	4.68	4.69
Oct.	4.68	4.74
Nov.	4.71	4.73
Dec.	4.66	4.76